

REMARKS

Claim 27 is amended. New claim 38 is added. Claims 27, 33 and 36-38 are pending in the application.

Claims 27, 33, 36 and 37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Yao, U.S. Patent No. 6,133,613, as combined with Lin, U.S. Patent No. 5,883,011. The Examiner is reminded by direction to MPEP § 2143 that a proper obviousness rejection has the following three requirements: 1) there must be some suggestion or motivation to modify or combine reference teachings; 2) there must be a reasonable expectation of success; and 3) the combined references must teach or suggest all of the claim limitations. Claims 27, 33 and 36-37 are allowable over the cited combination of Yao and Lin for at least the reason that the cited combination fails to disclose or suggest each and every limitation in any of those claims.

As amended independent claim 27 recites a layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ formed over and in physical contact with a metal silicide, the metal silicide being subjected to an anneal treatment after the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ is formed. Claim 27 further recites a polysilicon layer, a gate oxide layer, the metal silicide layer, the $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ layer and a silicon nitride layer all being patterned to form a gate stack. The amendment to claim 27 is supported by the specification at, for example, page 9, line 20 through page 10, line 2; page 2, line 11 through page 3, line 3; page 11, lines 8-16; and Fig. 6.

Yao discloses an embodiment having a tungsten silicide layer 506, forming a SiON layer 508 over the tungsten silicide layer, forming a SiN layer on the SiON layer, forming a photoresist layer 516 on the SiN layer and patterning the photoresist layer (col. 4, ll. 13-44).

Yao does not disclose or suggest the claim 27 recited layers patterned to form a gate

stack. Further, Yao does not disclose or suggest the claim 27 recited layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ formed over and in physical contact with a metal silicide, the metal silicide being subjected to an anneal treatment after the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ is formed. As indicated in applicant's specification at, for example, page 9, line 20 through page 10, line 2; and page 2, line 11 through page 3, line 3, providing the $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ layer over the silicide layer prior to annealing protects the underlying silicide layer from exposure to gaseous oxygen during annealing. As further described, if the silicide layer is exposed to gaseous forms of oxygen during anneal the silicide layer can become oxidized and adversely affect conductivity of the layer. Accordingly, the recited subjecting to an anneal treatment after formation of the $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ layer is formed confers specific benefits to the recited gate stack relative to the subject matter disclosed in Yao. Accordingly, independent claim 27 is not rendered obvious by Yao.

Lin discloses formation of an inorganic BARC layer 108 on a sacrificial layer 106, the BARC layer comprising SiON or alternative materials (col. 4, ll. 22-27). Lin does not disclose or suggest the claim 27 recited metal silicide layer, or the recited layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ formed over and in physical contact with the metal silicide layer. Accordingly, Lin cannot be combined to suggest the claim 27 recited metal silicide being subjected to an anneal treatment after the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ is formed. As combined, Yao and Lin fail to disclose or suggest the claim 27 recited gate stack having a metal silicide layer which is subjected to an anneal treatment after formation of a layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ over and in physical contact with the metal silicide. Accordingly, independent claim 27 is allowable over the cited combination of Yao and Lin.

Dependent claims 33, 36 and 37 are allowable over the cited combination of Yao

and Lin for at least the reason that they depend from allowable base claim 27.

New claim 38 does not add "new matter" to the application since the new claim is fully supported by the specification as originally filed. Claim 38 is supported by the specification at, for example, page 8, lines 10-18; and page 2, lines 11-18. New claim 38 is allowable over the cited combination of Yao and Lin for at least the reasons that it depends from allowable base claim 27 and that the references, individually or as combined, fail to disclose or suggest the recited metal silicide layer comprising titanium.

For the reasons discussed above claims 27, 33 and 36-38 are allowable. Accordingly, applicant respectfully requests formal allowance of pending claims 27, 33 and 36-38 in the Examiner's next action.

Respectfully submitted,

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By:

Jennifer J. Taylor
Jennifer J. Taylor, Ph.D.
Reg. No. 48,711



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Inventor..... Zhiping Yin et al.
Assignee..... Micron Technology, Inc.
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VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING
RESPONSE TO NOVEMBER 5, 2002 FINAL OFFICE ACTION

In the Claims

The claims have been amended as follows. Underlines indicate insertions and
~~strikeouts~~ indicate deletions.

27. (Amended) A gate stack, comprising:

a polysilicon layer over a semiconductive substrate;

a gate oxide layer on the polysilicon layer;

a metal silicide layer on the gate oxide layer;

a layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ formed over and in physical contact with the metal
silicide, wherein x is from 0.39 to 0.65, y is from 0.02 to 0.56, and z is from 0.05 to 0.33;
the metal silicide being the product of a process in which the metal silicide is subjected to
an anneal treatment after the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$ is formed; and

a silicon nitride layer on the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$, the polysilicon layer, the
gate oxide layer, the metal silicide layer, the layer comprising $\text{Si}_x\text{N}_y\text{O}_z\text{:H}$, and the silicon
nitride layer being patterned to form the gate stack.



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